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ABSTRACT

As part of a graduate research course, nine students formed a research team to carry out all aspects of a multimethod research study, including design, data collection and analysis, interpretation, and presentation of results in a final evaluation report to a local school corporation. Benefits and challenges were noted by both the instructor and students. The students benefited through increased communication and collaborative skills, increased awareness of the complexities and complications of real-world research, involvement in all aspects of the research process, and the opportunity to follow the research through to its completion. Their research mentor benefited through observation of the increasing sophistication of his students' research skills, the establishment of a working relationship with the school corporation, and the opportunities for joint presentations and publications with his students. Logistical challenges noted by both mentor and apprentices related to the size of the research group, the amount of data collected, and the need to coordinate researchers' and public school schedules. Suggestions are given for those interested in implementing a similar approach with their students. (Contains 1 table, 1 figure, and 18 references.) (Author)

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An Apprenticeship Approach to Inducting Novices into Research Practice

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As part of a graduate research course, nine students formed a research team to carry out all aspects of a multi-method research study including design, data collection and analysis, interpretation, and presentation of results in a final evaluation report for a local school corporation. Benefits and challenges were noted by both the instructor and students. The graduate students benefited through increased communication and collaborative skills, increased awareness of the complexities and complications of real-world research, involvement in all aspects of the research process, and the opportunity to follow the research through to completion. Their research mentor benefited through observation of the increasing sophistication of his students' research skills, the establishment of a working relationship with the school corporation, and the opportunities for joint presentations and publications with his students. Logistical challenges noted by both mentor and apprentices related to the size of the research group, the amount of data collected, and the need to coordinate researchers' and public school schedules. Suggestions are given for those interested in implementing a similar approach with their students.

Graduate schools are designed to help students become *productive* professionals who are skilled in the initiation, implementation, completion, and presentation of ongoing research activities. Ideally, students should be introduced to, and trained in, all aspects of the research process prior to conducting their thesis research including: selection of a research topic, generation of meaningful hypotheses or guiding questions, implementation of research methods, analysis of quantitative and/or qualitative data, presentation/publication of results, procurement of funding, and collaboration with others (Anderson & Louis, 1994; Sipe & Doherty, 1993).

Unfortunately, many graduate students are not familiar with these processes and are not prepared to begin, follow through with, and communicate the results of their own independent research efforts (Cuetara & LeCapitaine, 1991; Shadish, 1994). Both graduate students and faculty have indicated that students do not receive proper training and/or mentoring in regards to the complete research process (Butki & Andersen, 1994; Crespi, 1994; Goodyear, Crego, & Johnston, 1992; Thompson, 1994).

According to Clark (1978), "one of the foremost goals of all doctoral programs is to produce graduates who are both capable of and motivated toward scholarship" (p. 166). Yet many students leave graduate school with only one research study (their dissertation) to their credit and with few, or no, publications. Langenbach, Vaughn, and Aagaard (1994) stated: "Far too many theses and dissertations represent the student's first attempt at research. And for many, the thesis or dissertation, if completed, is also their last attempt at a research effort" (p. x). Cuetara and LeCapitaine (1991) indicated that from one third to one half of all doctoral students do not even complete their dissertations and attribute this outcome, at least in part, to the research training environment provided by graduate programs.

Several methods have been suggested to involve graduate students more extensively in the entire research enterprise, including formation of research teams and other collaborative student groups, attendance at professional conferences, active reading of the research literature, participation in research internships/assistantships, and co-authorship of collaborative research papers (Anderson & Louis, 1994; Bettencourt, Bol, & Fraser, 1994; Cuetara & LeCapitaine, 1991; Loughead, Black, & Menefee, 1991; Osborne & Usher, 1994; Thompson, 1994). Specifically, it has been suggested that early and personal involvement in research is an important component in students' ability to select and complete a thesis topic, embrace proper attitudes toward research and publication, and gain confidence in selecting and implementing appropriate research methodologies (Anglin, Ross, & Morrison, 1995; Phillips & Russell, 1994).

In addition, it appears beneficial to involve students in research that is conducted in the context of real world settings (e.g., schools, communities, hospitals, etc.) as opposed to being implemented within the protective and artificial confines of a research institution (Sipe & Doherty, 1993). Challenges that must be faced in real life settings are seldom discussed in journal articles or research methodology textbooks. Although there is much that can be learned by reading about and discussing issues related to how to do research, there are a multitude of additional things that will be learned only by

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participating in the research process. Graduate students might be better prepared to handle the realistic constraints involved in actual settings if similar research experiences were incorporated into their graduate training (Phillips & Russell, 1994; Sipe & Doherty, 1993). In the words of Sipe and Doherty, this requires a "cultural and educational shift" in the teaching of research methods.

An Apprenticeship Approach to Research Training

A team or apprenticeship approach has been advocated as one method of inducting graduate students into the realities of research practice (Anderson & Louis, 1994; Loughead et al., 1991). Current pedagogical principles highlight the importance of learning by doing; of constructing individual understandings of processes and concepts by actively participating in real tasks in authentic settings (Anderson, Blumenfeld, Pintrich, Clark, Marx, & Peterson, 1995). The advantages of an apprenticeship approach stem from the incorporation of three critical features (as described by Resnick and Klopfer, 1989): 1) providing learners with real tasks that are typical of the conditions and contexts of work (e.g., writing for an audience who has a stake in the research results), 2) providing contextualized practice of tasks (e.g., rewriting interview questions after their initial tryout with the intended participants), and 3) providing multiple opportunities to observe others perform the tasks to be learned (e.g., engaging two more- or less-experienced observers in the same classroom so notes can be compared regarding effective observation techniques). By integrating these three apprenticeship features within a graduate research course, student researchers have the opportunity to engage in a wide range of research tasks that gradually approximate mature practice. Through "participation with more skilled partners in culturally organized activities" (Rogoff, 1990, p. 39), novice researchers can advance their skills and understanding of the norms and ethics of the research culture.

As part of a graduate research course, Instructional Design and Media Research, nine students formed a research team to carry out all aspects of a multi-method research study including design, data collection and analysis, interpretation, and presentation of the results in a final evaluation report for a local school corporation. The primary goal of this advanced course was to introduce graduate students to the complexity of research practice in a real-world setting in order to prepare them for future research endeavors, including the completion of masters' and doctoral theses. A secondary goal was related to the actual research project—to design and conduct an evaluation of a required ninth grade study skills course recently initiated by a local school corporation. This paper describes how an apprenticeship approach was used to accomplish both of these goals.

It is important to point out that this paper is not about the specific research that was conducted during the apprenticeship period (e.g., evaluation of a ninth grade study skills course), but rather is focused on the apprenticeship approach to research training. Thus, our emphasis in this paper will be on the research process as opposed to its resulting products. Although the school district found the results of the study particularly informative, especially as they began planning for the following year, the apprenticeship approach afforded each team member a highly unique and valued learning experience. It is our hope that by outlining the logistics of this approach and describing both the instructor's and students' perceptions of the benefits and challenges of the experience, we can provide useful suggestions for others who may be considering adopting a similar approach. Based on our own evaluations, such an approach has the potential to motivate and enable students to become independent researchers.

Procedures

The setting

Instructional Design and Media Research is an upper level graduate course offered approximately once a year. Enrollment numbers tend to be small—between 5-10 students per year. The two main purposes of the course, as stated in the syllabus, are for students: 1) to gain experience in the design, implementation, analysis, and reporting of research investigations and 2) to examine relevant research topics in detail. In previous semesters, the instructor had involved students in a small laboratory-based research study, while simultaneously providing instruction on various research methods and analysis techniques. This was the first semester in which the "assigned" research involved the collection and interpretation of qualitative data in a school-based study. Although these additional elements were perceived as beneficial, they added a layer of complexity not previously encountered.

The participants

The research team was comprised of one faculty member and nine graduate students. All nine students were female; the professor was male. Five students were enrolled in the Ph.D. program in Educational Computing and Instructional Design; three were in the masters program in the same area and one was a masters student in the department of veterinary anatomy. A wide range of backgrounds and work experiences were represented: two students were Hispanic, one was Chinese, six were American; students had worked in areas as diverse as veterinary medicine, special education, business and industry, communications, and extension education. Students were at various stages in their respective programs of study, although the majority had no prior research experiences. The instructor had been at the university for 10 years, had taught this course for 6 years, and

was primarily versed in quantitative methodology and statistical analysis techniques. One student had completed a qualitative research methods course; two students were enrolled in the qualitative course at the time.

The makeup of the research class during the time of the apprenticeship was somewhat atypical. Six of the nine members were also members of a research group (PRISM) that had been meeting for over a year. These six members and the professor knew each other well and had gained a great deal of background knowledge relevant to the study that would be pursued. The advantage to this was that much of the preparation for the research effort was undertaken prior to the beginning of the course (e.g., conducting a literature review, drafting data collection instruments, negotiating entry into the research setting, establishing a tentative timeline). However, this posed some difficulties for the remaining three class members who had to be brought quickly "up to speed" regarding the specific study they were being asked to co-conduct.

In the next section of this paper, we describe some of the logistics of setting up and implementing the evaluation study and present a timeline that outlines the extent and focus of our research efforts during the semester, as well as immediately prior and subsequent to the 16-week course. This places the course within the larger timeframe/context in which all aspects of the research study were completed.

The research study

In the spring of 1994, PRISM obtained permission to evaluate a new study skills course that would be required of all incoming ninth graders (1994-1995) in a local school corporation. This included two high schools, 4 teachers, and approximately 600 students per year. According to the Assistant Superintendent, the course was designed to "build skills, knowledge, and attitudes necessary for a successful high school career and entry into the workforce." Although the course was divided into three major areas (study skills, workplace skills, and career planning) we focused our evaluation exclusively on the first of these, study skills. Our specific research questions were

- How do students respond to the study skills instruction?
- Do students actually acquire new study skills from the course?
- Do students successfully use these skills in their other courses?

Members of the PRISM research group met regularly during the spring and summer months to gather additional background information, to survey and meet with the district teachers, and to outline plans for data collection. Figure 1 indicates the types of activities that were conducted during this time and illustrates the numerous overlaps that occurred among tasks.

Insert Figure 1 about here

Despite all of this advance planning, when the fall semester started at the university, we were quickly overwhelmed by the realities of the study. Not only had the school district started classes a week prior to the university, but a number of issues/questions arose that had previously been overlooked. How exactly were we going to select interview participants? How many students should each researcher interview? What about obtaining parental permission? Shouldn't we be observing in the study skills classrooms? Who was going to observe which teacher(s) and when? Before any of us felt prepared to begin, pretest measures were completed by all 600+ students and the portion of the course that we most wished to observe was into its second week. Bringing new team members up to speed while simultaneously making decisions about all of the specifics of the study, was in the words of one member, "a logistical nightmare." Getting and staying organized was one of the most pervasive challenges we faced throughout the research effort.

Adding to the logistical considerations were our own demanding work and course schedules, the continual changes in the high school schedules due to intervening scheduled and unscheduled activities, absent students, school closures, and malfunctioning equipment. The research group found it necessary to meet twice a week (2 hours/session) in order to keep abreast of ongoing data collection needs, as well as to keep informed of upcoming changes in the high school schedules. At the beginning of the semester, team members attempted to focus on the study logistics one day and on pre-determined course topics on the other. Initially there appeared to be some concern, by both the instructor and the students, that an established list of topics be covered in a logical sequenced fashion. However, we all soon realized that topics were most relevant when they arose naturally from the context of the study. What became apparent later was that although the order of topics discussed was not the same as in a typical semester, the number and types of topics were. Topics included such things as: the research process, observation and interview techniques, coding data, triangulation, internal and external validity, and guidelines for writing and evaluating research reports. Although specific topics are not included on the timeline (see Figure 1), an indication is made as to when these discussions were held.

At the end of the semester, each graduate student chose one aspect of the study on which to focus her final research report (e.g., teachers' use of embedded and detached teaching strategies, freshmen attitudes towards study skills instruction, use of study skills across content areas). In addition, each graduate student wrote a section of the final evaluation report to be presented to the school corporation (e.g.,

purpose and context of the study, methods of data collection and analysis, recommendations, etc.). These reports were collated by the professor and presented at a school board meeting. As a final "assignment" each team member prepared a reflection paper describing his/her individual perceptions of the personal/professional benefits of the experience, personal challenges arising from participating on a research team, and essential components for successfully utilizing this approach in the future. Two members conducted a qualitative analysis of these reflections, looking for general patterns and themes across individuals. These are described in the remainder of the paper.

Results

Perceived Benefits

Overall, perceived benefits of participation in this apprenticeship approach centered around the promotion of personal and professional growth (see Table 1). In terms of personal growth, members indicated that the process increased both communication and interpersonal skills ("Research groups are a delicate business where listening skills, patience, and respect are constantly at work."). Members described how the experience cultivated their curiosity and sharpened both collaboration skills and a sense of individual responsibility for completing the necessary research tasks ("I found the initial stages of the study to be both stimulating and exciting. Although I hate deadlines, the adrenaline gets pumping and I really start working!"). Group members quickly recognized individual's strengths in different research areas and capitalized on each other's expertise ("Since it was a shared experience, the combined knowledge of the group was significant."). Not only did this facilitate the research process, but it enabled members to assess their own personal strengths and weaknesses as researchers. As one member stated, "Camaraderie provides for a conducive non-threatening learning experience and allows for insightful self assessments."

Insert Table 1 about here

Professional skills were perceived to be enhanced in the areas of: appreciation for the complexities of research, increased analytical and reflective skills, recognition of differing viewpoints, and the ability to synthesize concepts and principles into a multifaceted and coherent plan of action ("Working in a research group is a positive experience, especially if it is your first research experience. The group feedback and discussion can be positive and increase the learning process."; "I appreciated having so much information collected and hearing others' views, experiences, and insights.").

Many members mentioned benefiting from a "hands-on" approach to learning about research. Members had a chance to "learn through mistakes in an environment where the stakes were not too high." Because the research was conducted in the schools, members gained "a very different perspective of research and the different types of elements you will encounter (e.g., scheduling, populations, environments, etc.)." Although some of the footwork was completed prior to the research course, members saw great benefits to having participated in the entire research process. Each member experienced each task: designing a study, creating instruments, interviewing students, completing classroom observations, analyzing data, and writing a research report.

From the professor's point of view, being a part of a team of researchers was enjoyable and had the added benefit of decreasing both student/professor workloads and responsibility ("As a group they divided up the interviews and observations so that no one person was required to spend an exorbitant amount of time in the field, yet all got field experience."). The greatest benefit to the professor appeared to be the changes that he observed in his students—they learned to coach and support each other rather than having to depend solely on his feedback and guidance. They learned to be more cautious when making research decisions and appeared better prepared to begin their own research projects. In addition, PRISM established a good working relationship with the school district which may lead to future collaborative efforts. In sum, the instructor viewed this approach as an effective platform for integrating teaching, research, and service.

Challenges

Perceived challenges of this experience related primarily to logistical and organizational aspects (see Table 1). A unique public high school class schedule led to some confusion regarding observation and interview schedules and to a hectic work pace at times. The nine-member group experienced difficulty getting and staying focused during meetings, as well as trying to reach consensus on various research issues ("There's too much discussion during planning--it takes too long to move ahead. It seems that at every class meeting we changed the interview instrument."). The size of the group was unwieldy at times, leading to some confusion about deadlines, labor division, and scheduling needs. In addition, tracking the incoming data and assuring its completeness and uniformity proved challenging.

Additional challenges related to interpersonal skills and group dynamics ("Everyone wanted to be in charge but no one wanted to be told what to do."). Varying levels of interest in different aspects of the study, of understanding the pertinent research issues, and of commitment to the research process led to occasional frustration ("Group discussions needed to be supervised so that all participants could learn and feel free to participate.").

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Finally, analysis procedures proved to be problematic at times. It was difficult to maintain consistency of analysis methods with data originating from multiple sources and researchers, as well as having to be completed within a relatively short period of time ("There was a massive amount of work to accomplish and incredible amounts of data to analyze."). Part of this frustration related to members' lack of experience with qualitative methods and the expectation that observations and interviews should be "standardized" in the same way as quantitative measures ("We should have used the random digits table to select interview subjects."). Because of the time constraints of the semester all of these issues could not be adequately addressed.

The challenge for the professor was to get all students involved in the total process, to keep track of what everyone was doing, to use course time to discuss important research issues, and to finish the study by the time the semester was over. The course sequence tended to be directed by the needs of the students as they encountered difficult aspects or unfamiliar procedures required by the study. The instructor had to constantly revise his intended agenda to accommodate more immediate needs. Being part of a research team changed the instructor's role in ways which were less familiar as well as less comfortable to both the instructor and the students. Rather than serve as the "expert" or primary knowledge dispenser, he assumed the role of a facilitator or coach. He shared frustrations, similar to those of his students, regarding his changing role. Students still expected him to lead ("I sometimes felt like no one was in charge."), yet he chose to learn alongside, as well as from, the students ("I could see their frustration when I would say, 'I don't know. What do you think?'"). In addition, because the instructor did not actually engage in all aspects of data collection, he mentioned that it was easy to grow "distant" from the data.

It is worth noting that although the specific benefits and challenges mentioned here describe the specific experiences of this group, many of these components could easily be listed under the opposite category depending on the particular dynamics of the group. Working as a team can be both a benefit and a challenge depending on how well team members cooperate, share work-loads, and support each other's efforts. Everyone pulled their own weight in this group; members were willing to help each other during difficult or demanding times ("I found myself doing a few extra things to not let the others down."). This led to an overall sense of accomplishment and satisfaction by both the students and professor at the end of the experience.

Summary and Recommendations

Following reflection on the completed experience, the research group identified several components which seemed essential for success. Some of these were actually experienced as a part of this approach and were believed to have facilitated our understanding of collaborative, real-life research procedures; others were identified by their absence from this experience. The critical logistical components that were identified included: clear understanding of the research purpose and guiding questions; organization; careful delineation of members' roles; regular, weekly meetings; and a consistent format for collecting, tracking, analyzing, and reporting data. Important group characteristics which were identified included: a spirit of cooperation and enthusiasm, valuing individual's expertise, equal "status" for team members, acceptance of personality differences, ability to give and receive constructive criticism, diplomacy, and sensitivity to individual schedules and personal needs. Important personal responsibilities during the process included: sharing responsibility for work load, maintaining current knowledge of relevant literature to facilitate discussion during meetings, and continual self-reflection on both the research process and products.

Finally, we believe that the success of this experience was facilitated by several mediating factors: 1) a meaningful purpose for the research (to evaluate a new course for a school corporation), 2) an immediate deadline (the end of the semester), 3) perceived relevance to graduate students' future career goals (to become researchers); 4) the opportunity to be part of a dedicated, enthusiastic team, and 5) formal course credit for the experience.

Conclusion

Members of this group have continued to hone their research skills through written reflections, whole group discussions, local and national presentations, and joint publications regarding both the research process they engaged in and the evaluation study they successfully completed. This initial research experience increased both skills and confidence among all members and may provide a workable model for other instructors to use in meeting the unique needs of their own students. As one student summarized:

> From the beginning, I saw it as a learning experience. I knew that I would be facing some of the same decisions in my own research--things like choosing subjects to interview, writing survey and interview questions, making observations, and interpreting/scoring observation and interview transcripts. It was a very practical experience and I was never bothered when things did not go as they were planned. I realized that it was a good exposure to a real-life research setting. I feel that it was an invaluable experience—I would recommend it to any graduate student.

Authors' Note: Other team members contributing to this research effort included Melissa Dark, Julie Leonard, and Feng-Qi Lai.

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Table 1.

Students' Perceived Benefits and Challenges of a Research Apprenticeship

Perceived Benefits	Perceived Challenges
Promotion of personal growth	*Logistical and organizational aspects*
• increased communication skills	• group size
• increased interpersonal skills	• staying focused during meetings
• sharpened collaboration skills	• scheduling observations and interviews
• recognition of individual strengths	• tracking incoming data
• cultivation of curiosity	• assuring the completeness and uniformity of the data
Promotion of professional growth	*Interpersonal skills and group dynamics*
• increased analytical and reflective skills	• resolving leadership and management issues
• recognition of differing viewpoints	• understanding pertinent research issues
• appreciation of complexities of research	• varying levels of interest in the research
• synthesis of concepts and principles into a plan of action	• reaching consensus on research issues

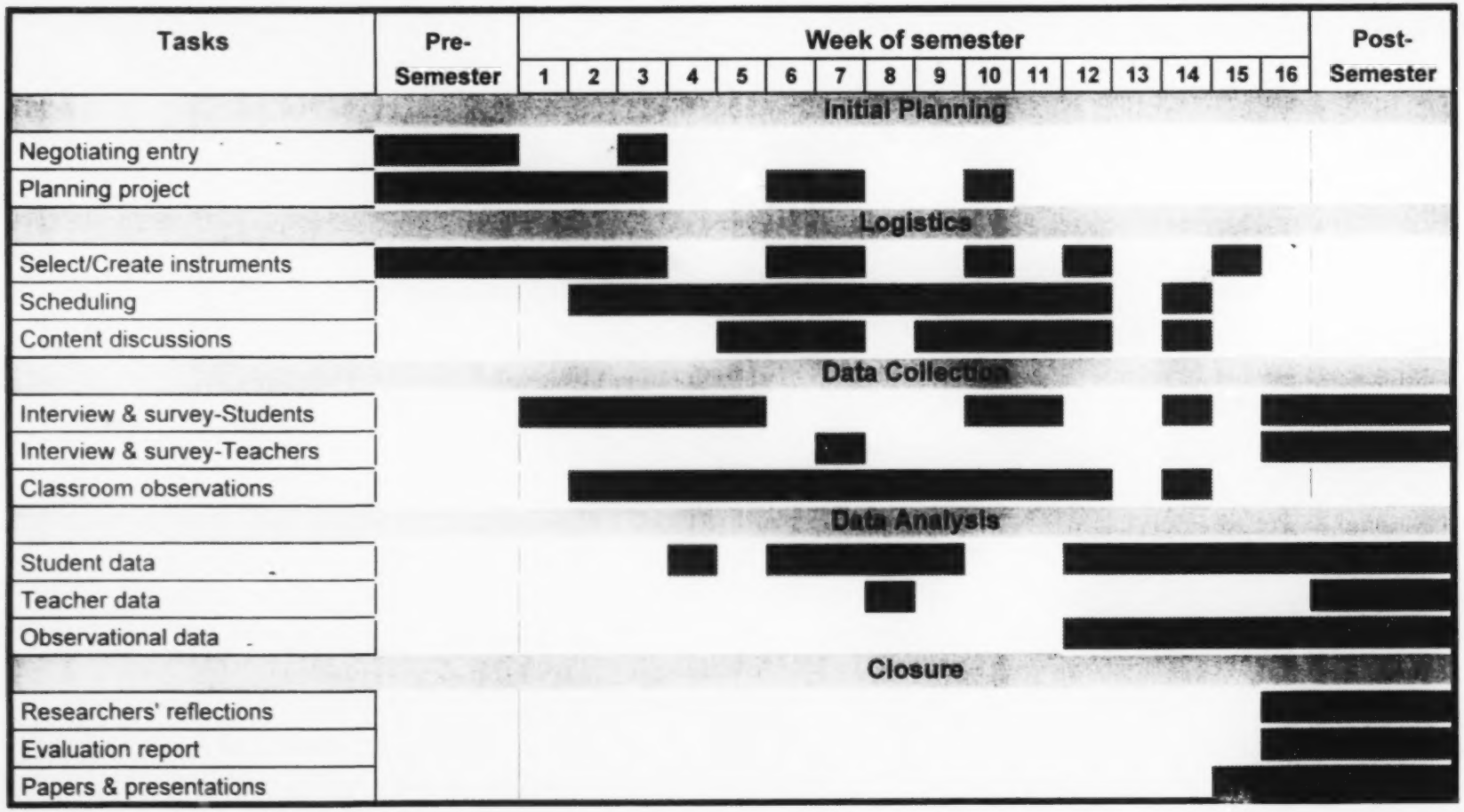

Figure 1. Relationship of research project tasks to course timeline, including pre- and post-semester tasks.

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